New discoveries from old sources, with reference to the original bird and mammal fauna of the Mascarene Islands, Indian Ocean

J.P. Hume & R.P. Prys-Jones

Hume, J.P. & R.P. Prys-Jones. New discoveries from old sources, with reference to the original bird and mammal fauna of the Mascarene Islands, Indian Ocean.
Zool. Med. Leiden 79-3 (8), 30-ix-2005, 85-95.— ISSN 0024-0672.
Julian P. Hume, Bird Group, Department of Zoology, The Natural History Museum, Akeman St, Tring, Herts HP23 6AP, U.K. and Palaeobiology Research Group, Department of Earth & Environmental Sciences, University of Portsmouth, Portsmouth, Hants PO1 3QL, U.K. (e-mail: J.Hume@bun.com).
Robert P. Prys-Jones, Bird Group, Department of Zoology, The Natural History Museum, Akeman St, Tring, Herts HP23 6AP, U.K. (e-mail: R.Prys-Jones@nhm.ac.uk).

Keywords: Mascarene Islands; extinct birds; iconographical evidence; journals; diaries; museum specimens; fossils; loans and exchanges.
The faunal history of the Mascarene Islands (Mauritius, Réunion and Rodrigues) has been extensively documented, with most information being derived from the fossil record, museum skins, the journals and logbooks of early mariners and contemporary illustrations. However, our research on original sources, including Dutch journals held at The Hague, and archival correspondence and fossil collections, notably at The Natural History Museum, London, and the University Museum of Zoology, Cambridge, indicates that many problems remain to be resolved. This situation has been exacerbated by exchange schemes amongst museums, personal rivalries, misidentification, lack of comparative material, and inadequate provenance of specimens; furthermore, problematic and unidentifiable fossil remains have been ignored or lumped with other species. Among other topics, new information is presented on the discovery of the famous Mare aux Songes fossil deposit on Mauritius. The Mascarene Islands epitomize the potential for new discoveries from old collections, even within the largest and most modern institutions.

Introduction

Interest in the collecting of natural history specimens has continued for many centuries, but it was not until the 19th century that scientific natural history collecting began to increase greatly. Such was the scale of material collected that problematic and unidentifiable specimens were often ignored or lumped with other species. The scope for oversight and confusion arising from this was further exacerbated by exchange schemes amongst museums, the lack of comparative reference material and inadequate provenance data of specimens.

The aim of this paper, using the Mascarene islands of Mauritius, Réunion and Rodrigues as an example, is to demonstrate how important scientific material can remain undetected, unappreciated or forgotten in museums over long periods of time and to highlight the potential of searching old collections and archives, even in the largest and most modern institutions.

Ships' logbooks and contemporary journals

It was not until the Dutch began exploring trading routes to the East Indies and discovered the island of Mauritius in 1598, claiming it for the Netherlands, that documented

records of the Mascarene area began (Barnwell, 1948; Moree, 1998, 2001). Logbooks and journals were kept in order to record logistical details, e.g. topographical profiles, sea passages, etc., and were also used by publishers for reference purposes in the production of popular books (Moree, 1998; Hume, 2003). Some of the earliest Mauritian illustrative records were published in this way, e.g. the first Dodo *Raphus cucullatus* (Linnaeus, 1758) illustration from van Neck's voyage (Het tweede Boeck, 1601). Many of the original journals still survive, stored in the Dutch Archives (Algemeen Rijksarchief) at The Hague in particular, but also elsewhere such as the South African Archives, Cape Town.

Réunion was not settled until the late 1640s (North-Coombes, 1980), and it was not until 1671-1672, that Dubois (1674) gave the most detailed early account of the native fauna, in a published edition which is now extremely rare. Dubois's descriptions have proved an essential aid to recent fossil discoveries in interpreting the original faunal composition of Réunion (Mourer-Chauviré et al., 1999).

Rodrigues, lying 574 km east of Mauritius, escaped serious human interest until the 1720s, because it was considered too far off the main trading routes to India and the East Indies (Moree, 1998). French exploitation of the island proved devastating (North-Coombes, 1971), and within 50 years the island was irreversibly damaged. The two most important accounts concerning the original fauna from Rodrigues were that of Leguat (1708) and the manuscript written in ca. 1726 by Tafforet (Dupon, 1973). Leguat gave a memorable account of the Solitaire *Pezophaps solitaria* (Gmelin, 1789), the closest relative of the Dodo of Mauritius, and in describing its nesting behaviour became the first person to mention territorial and lekking behaviour in birds (Armstrong, 1953; Livezey, 1993). Tafforet, unlike Leguat, gave details about Rodrigues passerines, notably describing the now extinct Rodrigues Starling *Necropsar rodericanus* Günther and Newton, 1879, and he also discussed the flora in greater detail.

Subsequent to the discovery of Mauritius in 1598, a fleet under Admiral Wolphert Harmenszoon anchored off Black River Bay in 1601 for one month, and on board was Joris Laerle, an artist of exceptional ability (Hume, 2003). A journal was kept of the entire voyage (Gelderland Journal), and Laerle's job was to draw topographical landfalls, suitable areas for anchorage, natural history specimens and any items of interest in this journal. During the fleet's stay at Mauritius, Laerle drew the only pictures of some of the extinct Mauritian birds made from life and on Mauritian soil. Close examination of the Gelderland journal illustrations has revealed further pencil drawings by Laerle, underlying the finished ink illustrations, which have provided better insight into some extinct birds' external morphology (Hume, 2003).

Also contained in the Algemeen Rijksarchief and the Cape Archives, South Africa, are the journals and letters of some of the early Dutch commanders and chiefs on Mauritius. Some of the commanders were stationed on Mauritius for many years, e.g. Commander Hubert Hugo (1673-1677) and Chief Isaac Lamotius (1677-1692) (Moree, 1998), and included in their journals were daily reports on hunting, collecting of ebony, incoming and outgoing trade and other matters relevant to the VOC (Dutch East India Company).

From a detailed review of the evidence available to him, Cheke (1987) concluded that the Dodo became extinct on Mauritius in the 1660s. He further argued that the name 'Dodo' (dodaers in Dutch) had subsequently become transferred to another flightless bird, the Red Rail *Aphanapteryx bonasia* Sélys Longchamps, 1848, and that it is to this

species that the few post 1660s references to "Dodos" he was aware of in reality refer. However, recent study in the South African Archives (Hume et al., 2004) has revealed letters in which Hugo describes taking Dodos in 1673 and further journal parts in which Lamotius mentions hunters bringing back Dodos as late as 1688. Would such knowledgeable people really have confused Red Rails with Dodos? Lamotius in particular was an educated man, an inventor, a natural historian and an artist (Moree, 1998; Sleigh, pers. comm.), who comes across as an astute observer of fauna and flora. Nevertheless, Dodos must obviously have been very rare by the late 1670s as Lamotius only mentions them on very few occasions during his 15 years of residence.

Contemporary art

Natural history was a very popular subject for art compositions during the late 16th - early 17th centuries, and animal species were often set in mythical or religious scenes (Jackson, 1993, 1999). Live and dead natural history specimens were increasingly being brought back by trading fleets and making their way to the various menageries and private collections. Thus in 1599 the first living Cassowary *Casuarius casuarius* (Linnaeus, 1758) arrived from New Guinea and was still alive until at least 1650 (Rothschild, 1900). In Prague, Emperor Rudolf II's collection included the first Dodo specimen (possibly brought back by van Neck in 1599), the only Mauritian Red Rail ever to reach Europe, as well as the first specimen of the larger Mauritian Flying Fox *Pteropus niger* Kerr, 1792, hitherto unrecognised (Cheke & Hume, in prep), all of which were painted around 1607 (Bauer & Haupt, 1976).

Brisson (1760) and Buffon (1770-83) received and described a significant series of live and dead Mauritian and Réunion birds, which were illustrated by Martinet (Buffon, 1770-83, Planches enluminées edition). These illustrations are of paramount importance in determining the original morphology and colour of extinct species, as insect attack and inadequate preservation techniques have resulted in the loss of most specimens (Farber, 1982). Mauritian natural history depictions by Jossigny, illustrator of some of the specimens obtained by the botanist, Philibert Commerson, are dated ca. 1770. Included in this collection are two pictures of Mascarene birds, which were poorly reproduced by Oustalet (1897). One of these, the Mauritius Scops Owl *Mascarenotus sauzieri* (Newton and Gadow, 1893), became extinct by the mid 19th century and is unknown from skins; the other is a generally overlooked illustration of a live Rodrigues Parakeet *Psittacula exsul* (Newton, 1872), which has been extinct since the 1870s (Hume, unpubl.).

Much literature has been devoted to the possible former existence of a second species of dodo on Réunion (Cheke, 1987). Evidence deduced from contemporary accounts and illustrations appeared to suggest that a white dodo with yellow wings survived on Réunion until at least 1710 (Newton, 1869; Oudemans, 1917; Rothschild, 1919; Hachisuka, 1953). The contemporary observers described a whitish bird (termed the 'solitaire') with an iridescent yellowish sheen, black tips to the wings and tail, a beak like a Woodcock *Scolopax rusticola* Linnaeus, 1758, and feet like a Turkey *Meleagris gallopavo* Linnaeus 1758 (see Mourer-Chauviré et al., 1999). However, fossils discovered in 1974 demonstrated that a previously unsuspected species of ibis formerly occurred on Réunion (Mourer-Chauviré & Moutou, 1987). Better material collected in 1995 proved that the Réunion ibis belonged in the genus *Threskiornis* (Mourer-Chauviré et al., 1995a), and it

was then suggested that the accounts referring to the Reunion solitaire were in fact describing an ibis and not a Dodo (Mourer-Chauviré et al., 1995b).

An obstacle to this conclusion was the existence of a series of white dodo paintings painted by two Dutch artists, Pieter Holsteyn and Pieter Withoos, and attributed to the Réunion bird (Newton, 1869). However, prior to these, Roelant Savery, the best known and the most prolific of the dodo artists, was employed by Emperor Rudolf II in Prague to illustrate his menagerie collection (Spicer, 2000). Around 1611, Savery painted a white dodo with yellow wings that has been hitherto overlooked by historians and ornithologists (Valledor de Lozoya, 2003; Hume & Cheke, 2004). This specimen was also listed in an inventory of species kept by Daniel Froschl in ca. 1606, where he describes a whitish specimen of dodo (Wissen, 1995).

This indicates that a whitish specimen of dodo must have been brought to Europe prior to ca. 1606. Given the early date, this could only have been obtained on Mauritius, not Réunion. This specimen would have been available to Savery in Prague to illustrate; thereafter, Holsteyn and Withoos either copied Savery's white dodo image or had access to the same specimen (Hume & Cheke, 2004).

Fossil collections

In 1865, a fossil-rich marshy area called the Mare aux Songes was discovered on Mauritius (Clark, 1866). It was from this marsh that almost all known dodo remains were collected (Wissen, 1995), and further fossil species continued to be collected here up to the early 1900s (Newton & Gadow, 1893; Carié, 1930). The only other Mauritian fossil deposits so far discovered were by Etienne Thirioux, a hair-dresser and amateur naturalist, who collected extremely important fossil material in the late 1890s and early 1900s from unspecified localities (Newton, 1904).

Rodrigues is unique within the Mascarenes as it contains a large limestone plain called the Plaine Corail on the southwest coast (Saddul, 1995). Caverns have been winnowed out by the action of water and, where roof collapse occurs, the caverns have become perfect natural traps for the original fauna, which has been excavated and described since the 1800s (e.g. Milne-Edwards, 1867; Newton & Newton, 1876; Günther & Newton, 1879; Cowles, 1987).

Remarkably, it was only in 1974 that vertebrate fossils were first discovered on Réunion (Mourer-Chauviré et al., 1999). These came out of a cave deposit discovered by Bertrand Kevazo in north-west Réunion, but further fossil localities have since been found (Mourer-Chauviré et al., 1999). New taxa have been described from this fossil material, some of which correspond to species described in the early written accounts, but smaller vertebrates such as passerines and bats are to date very poorly represented.

The diversity and phylogenies of parrots of the Mascarenes have caused much debate, and many issues remain unresolved. The Mauritian Broad-billed Parrot *Lophopsittacus mauritianus* (Owen, 1866), known by early visitors to Mauritius as the Indian raven or crow, in particular has been subject to much erroneous attribution and misconception. This species, one of the world's largest parrots, had a number of morphological and ecological adaptations attributed to it (e.g. Hachisuka, 1953; Holyoak, 1971), some of which appear erroneous based on a re-examination of all available material (Hume, 2003).

For example, Holyoak (1971) examined the fossil remains of the Broad-billed Parrot and concluded that although the jaws were huge, they were weakly constructed and this parrot must have fed on soft fruits. A comparison made with other large-jawed parrot species undermines this conclusion. The structure of the mandible and the palatines is comparable to the largest living member of the parrots, the Hyacinth Macaw *Anodorhynchus hyacinthinus* (Latham, 1790). Hyacinth Macaws mainly feed on the extremely hard-shelled palm nuts and require immense strength to crack them open – a feat they achieve with ease (Juniper & Parr, 1998). Palms were a dominant component of Mauritian forests (Cheke, 1987) and, along with a number of tree genera that yield hard-shelled fruits, produce plentiful quantities of fruit. The Broad-billed Parrot would have required large powerful jaws to utilise this food source and the morphology of the jaw structure suggests it did just that.

The relative paucity of available fossil and comparative material, particularly during the 19th century, was probably the main factor underlying not infrequent misidentification of fossil remains. Skeletal remains collected by Théodore Sauzier from the Mare aux Songes locality, Mauritius, were assigned to the Malagasy race of the Moorhen *Gallinula chloropus pyrrhorrhoa* A. Newton, 1861 (Newton & Gadow, 1893). However, it now appears that the Moorhen is a comparatively recent colonist, probably arriving after man altered the habitat and exterminated an endemic species occupying a similar niche (Cheke & Hume, in prep.). Subsequently, Cowles (1987) re-examined the fossil *G. c. pyrrhorrhoa* material and assigned it to the genus *Dryolimnas* (White-Throated Rail), conspecific with the nominate taxon *D. cuvieri cuvieri* (Pucheran, 1845). However, more recent comparisons with *D. c. cuvieri*, and the discovery of further fossil elements in the Thirioux collection, suggest that this material is actually referable to a distinct species of flightless rail, only doubtfully belonging to the genus *Dryolimnas* (Hume, unpubl.).

Skins and mounts

The collecting of bird skins *en masse* began in the early years of the 19th century. However, because of insufficient knowledge regarding specimen preservation, almost all pre-19th century skin material has now perished; by chance the remains of one of the oldest stuffed specimens in the world, the Oxford head and foot specimens of the dodo, have survived since the early 17th century. Unfortunately for the understanding of Mascarenes' natural history, by the time skin preservation techniques had been perfected and natural history exploration really taken off in the early 19th century, many of their endemic species had already disappeared and thus have not been preserved as skins.

Each of the Mascarene Islands once harboured an endemic owl of the genus *Mascarenotus* (Mourer-Chauviré et al., 1994), but all are now extinct. The Mauritian Scops Owl *M. sauzieri* (Newton and Gadow, 1893), is known from one drawing by Jossigny (Oustalet, 1897), a feather-by-feather description by Desjardins (1837) and a few fossil bones. The little we can determine about its ecology stems from one early account, which states that it called at night from the forests (Clark, 1859). Its skeletal morphology suggests that it had specialised adaptations for hunting reptiles and small birds, e.g. long leg bones and a strong pelvis (Mourer-Chauviré et al., 1994).

Clark (1859) stated that the owls were common in 1800 but had completely disappeared by the 1850s. No specimen was thought to have been collected, but in the Mauritius diary of Edward Newton held in the University Library, Cambridge, a comment is made about a specimen of Mauritian Scops Owl that was present in the Mauritius Institute collection until 1870 but was unfortunately lost during the cyclone of that year. Despite an extremely chequered subsequent history (Cheke, 2003), this collection still contains one of only three Mauritian Blue Pigeons *Alectroenas nitidissima* (Scopoli, 1786) in existence, one of 17 surviving skins of Réunion Starling *Fregilupus varius* (Boddaert, 1783), (possibly once having had two), and unique complete articulated skeletons of the Dodo, Red Rail and Mauritian Giant Skink *Leiolopisma* (*Didosaurus*) *mauritianus* Hoffstetter, 1949. It is a great misfortune to science that the unique Mauritian Scops Owl has not survived as a skin as well.

An 1834 date of extinction for the Mascarene Parrot *Mascarinus mascarinus* (Linnaeus, 1771), has long been cited in the literature (Milne-Edwards & Oustalet, 1893; Rothschild, 1907; Hachisuka, 1953; Forshaw, 1989; Day, 1981; Fuller, 1987, 2001), all based on the account by Hahn (1834), although Newton and Newton (1876: 287) expressed doubts about this observation without giving any reasons why. The species is nowadays known from only two skins: one in the Paris Muséum National d'Histoire Naturelle, and a partially albinistic specimen in the Vienna Museum (Greenway, 1967). However, at least three Mascarene Parrots arrived alive in Paris during the 1770s (Mauduyt, 1784), the decade in which the species was last recorded from Reunion, one of which was described in great detail by Brisson (1760) and Buffon (1770–1783).

The brief description by Hahn (1834), supposedly based on a living individual which must have been over 50 years old at this time, reads as follows:

"Food: Fruits. Breeding: Unknown. Characters: It is not very lively and its call is harsh. There is a living individual in the menagerie of King Maximilian of Bavaria at Munich on which the illustration is based" (our translation).

He also included an illustration, which however is an almost direct copy of Martinet's plate in Buffon (Planches enluminées, edition 1770-83), executed some 50-60 years before. Furthermore, following the death of the King Maximilian on October 13th, 1825, the menagerie had been auctioned off on 25-28 August 1826, and an inventory details all species that were then present (Anon., 1826): no Mascarene Parrot is on the list. As many years presumably elapsed between when Hahn began his collection of data and the final publication of his book, his account could possibly date from pre 1826. However, the use of Martinet's image in his book, together with the fact that a parrot of this rarity would almost certainly have been mounted after its death, suggest that Hahn probably did not see a live bird. Therefore, there is no definite evidence that this species survived the turn of the 19th century.

Correspondence and diaries

Some of the most important Mascarene archival material consists of correspondence between scientists and field collectors. Specific details were often written in diaries, letters and manuscript notes, which were subsequently over-looked, deemed not relevant to publications produced at the time or were simply not available until the death of the owners. For example, important correspondence occurred during the

excavation of the Mare aux Songes, Mauritius, between Richard Owen at the (then) British Museum and George Clark on Mauritius, as well as between Edward Newton, who spent time as Assistant Colonial Secretary on Mauritius, and his brother Alfred.

In the early 1860s, George Clark was searching areas of Mauritius for remains of the Dodo. In 1866 he published his discovery of Dodo material in the Mare aux Songes marsh in September 1865 and claimed exclusive rights to it (Clark, 1866). It has recently become apparent, however, that Clark may not in fact have been the original discoverer of the site (Hume & McOran-Campbell, unpubl.).

H.R. Higginson was a railway engineer who arrived on Mauritius in 1862 to design and construct a Mauritian government railway completed in October 1865. Higginson kept a diary of events whilst in Mauritius, in which he made an entry concerning the Mare aux Songes (termed 'Morass'). The diary was not a day by day account, as a series of post dated events were all written under the same heading, some occurring months before. Higginson headed a page dated 19 Oct 1865 as 'Discovery of the Dodo' and part of the account reads:

"I noticed some coolies removing some peat soil from a small morass. They were separating and placing into heaps a number of bones of various sorts among the debris…

…A Mr Clarke, the Government schoolmaster at Mahebourg, had Professor Owen's book on the Dodo so I took the bones to him for comparison with the book plates. The result showed that many of the bones undoubtedly belonged to the Dodo. This was so important a discovery that Clarke obtained leave to go out to the Morass and personally superintend the search for more…".

Amongst the correspondence kept by the comparative anatomist Richard Owen, now part of The Natural History Museum Archives, are letters from George Clark to him describing details of the discovery of Dodo bones from the Mare aux Songes. Clark wasted no time in getting the material sent to London and Owen received the first consignment in October 1865 and a second in November. Owen lectured on the material at a meeting of the Zoological Society of London on 9 January 1866 and published his memoir containing his description of the Dodo's skeletal anatomy in September of that year (Owen & Broderip, 1866). A consignment of dodo material was sold to the British Museum for which Clark received £ 100 (Wissen, 1995); yet another consignment was auctioned in October 1866 (Anon., 1866).

Considering the diary and archival evidence, it seems probable that Higginson had in fact been the discoverer of fossils at the Mare aux Songes and had then shown Clark the site. Higginson's interest in the Dodo remains was clearly not one of monetary gain as he donated almost complete skeletons to museums in Liverpool, York and Leeds; his connection to these has not hitherto been widely appreciated, but the accession dates and deposition have been confirmed (McOran, pers. comm.). Although not mentioned in his published account, Clark was well aware that another person had a claim to have discovered the Mare aux Songes site first. On the second page of a letter to Owen dated 6 July 1866, Clark is furiously denouncing an unnamed person for claiming to be the 'discoverer' of the Mare aux Songes: whether by chance or by purpose, the first page, which presumably included the identity of that person, is now missing.

Loan and exchange material

Exchange of material has traditionally been an important means by which museums have obtained specimens lacking in their collections. Similarly, loan material has been an important device for obtaining material on a short or long-term period for study. However, loan material can mistakenly or knowingly get accessioned into a collection and both this and exchange material can create serious problems concerning provenance of specimens.

An exchange and/or loan of material occurred in the late 19th or early 20th century between the University Museum of Zoology, Cambridge (UMZC), and The Natural History Museum, London (NHM). This material included Mascarene fossil birds and bats and a large assortment of unidentified fossil remains. It appears that material was sent from Cambridge to London, and provenance/collection data became separated from it and were lost. Our recent examination of this material has resulted in a number of important discoveries, which include hitherto unknown skeletal elements, e.g. of rails and parrots, and new distributions of Mascarene *Pteropus* fruit bats.

The large *Pteropus* fruit bats or flying foxes are widely distributed throughout the Indian Ocean, Australasia and the Pacific (Novak, 1991). Three species are known from the Mascarenes: *P. niger* Kerr, 1792, and *P. subniger* Kerr, 1792, from Mauritius and Réunion, and *P. rodericensis* Dobson, 1878, which had been assumed to be endemic to Rodrigues (Cheke & Dahl, 1981; Novak, 1991). A box of mainly uncatalogued specimens housed at the NHM, London, was recently found to contain a large series of fossil remains of Mascarene *Pteropus* fruit bats. Some of the better material, e.g. complete skulls, was labelled 'Mare aux Songes', Mauritius, whilst other less well-preserved skull material was labelled 'Rodrigues'. Unlike Rodrigues, where the fossil material is white, fossil skeletal elements from the Mare aux Songes are instantly recognisable, the majority being stained a deep chocolate brown. However, cave material from Mauritius, albeit scarce, is not stained in this way, the fossil bone being coloured a light tan to off-white. Amongst this Mauritian cave material are fossil specimens referable to *P. rodericensis*, proving that all three Mascarene *Pteropus* once occurred sympatrically on Mauritius (Hume, in prep.).

Conclusions

The Mascarene Islands are highly unusual amongst oceanic islands, as when discovered by European explorers, their ecology was essentially intact and unaltered by man. Unfortunately, by the time the islands were scientifically studied, they had undergone drastic changes and indeed they have often been used as an example epitomising western man's destructive effect on island ecosystems. Therefore, ascertaining the original biota must mainly be by extrapolating from contemporary accounts and the palaeontological record. In the case of the Mascarenes, this has proved to be no easy matter. Even though the exploitation of Mascarene fauna by man occurred only during the last 400 years – a comparatively recent period of time – frustratingly little has been preserved or documented. Furthermore, the Mascarenes have been subject to fossil collecting bias, whereby most effort has been directed at the more famous inhabitants, e.g. Dodo, and Solitaire, whilst other groups, e.g. small passerines, have been almost completely ignored.

Progress in understanding the original Mascarene fauna will therefore depend on a combination of minute re-examination of existing archival sources and museum specimens, in combination with renewed efforts at palaeontological exploration using all available modern techniques.

Acknowledgements

We would like to thank Ray Simons and Mike Brooke (University Museum Zoology, Cambridge), Sandra Chapman, Andy Currant and Paula Jenkins (Natural History Museum, London) for access to specimens, and Susan Snell for making available archive material held by the General Library, NHM. We thank Alastair McOran-Campbell for making available the Higginson diaries, Perry Moree of the Koninklijke Bibliotheek, and staff at the Algemeen Rijksarchief, The Hague, for access to archival material. We thank the staff at the Cape Archives, South Africa, and in particular, Daniel Sleigh, for their helpful assistance and advice. The NHM Special Funds Trust supported the trip to the Cape Archives, Cape Town, South Africa.

References

Anon., 1826. Verzeichnis ausländischer Thiere welche in dem königlichen Garten zu Nymphenburg am und den folgenden Tagen meistbietend verkauft werden. 4 pp.

Anon., 1866. A catalogue of the valuable and interesting series of Dodo Bones lately received from Mauritius. Auction and Sale catalogue, Sale No. 2604.— London.

Armstrong, E.A., 1953. Territory and birds. A concept which originated from study of an extinct species.— Discovery [July]: 223-224.

Barnwell, P.J., 1948. Visits and Despatches 1598-1948.— Port Louis, Mauritius.

Bauer, R. & H. Haupt, (eds), 1976. Das Kunstkammerinventar Kaiser Rudolfs II, 1607-1611.—Jahrb.Kunsthist. Samml. Wien 72: i-xiv, 1-191.

Brisson, M-J., 1760. Ornithologie. 6 vols.— Paris.

Buffon, G-L. LeClerc, Comte de, 1770-1783. Histoire naturelle des oiseaux. 9 vols.— Paris.

Carié, P., 1930. Le *Leguatia gigantea* Schlegel (Rallidae) a-t-il existé?— Bull. Mus. Natl. Hist. Nat., Paris (2)2: 204-213.

Cheke, A.S. & J.S. Dahl, 1981. The status of bats on the western Indian Ocean Islands with special reference to *Pteropus*.— Mammalia 45: 205-238.

Cheke, A.S., 1987. An ecological history of the Mascarene Islands, with special reference to extinctions and introductions of land vertebrates: 5-89.— In: A.W. Diamond, (ed.). Studies of Mascarene Island birds. Cambridge.

Cheke, A.S., 2003. Treasure Island – the rise and decline of a small tropical museum, the Mauritius Institute: 197-206.— In: N.J. Collar, C.T. Fisher & C.J. Feare, (eds.). Why museums matter: avian archives in an age of extinction. Bull. Brit. Orn. Cl., Supplement, 123A: 1-360.

Clark, G., 1859. A ramble round Mauritius with some excursions in the interior of that island; to which is added a familiar description of its fauna and some subjects of its flora.— In: Palmer & Bradshaw, (compilers). The Mauritius register: historical, official & commercial, corrected to the 30th June 1859: i-cxxxii. Port Louis, Mauritius.

Clark, G., 1866. Account of the late Discovery of Dodos' Remains in the Island of Mauritius.— Ibis 2: 141-146.

Cowles, G., 1987. The fossil record: 90-100.— In: A.W. Diamond, (ed.). Studies of Mascarene Island birds. Cambridge.

Day, D., 1981. The Doomsday book of animals.— London.

Desjardins, J., 1837. Huitième Rapp.— Ann. Trav. Soc. Hist. Nat. Ile Maurice.

Dubois, 1674. Les voyages faits par le sieur D.B. aux isles Dauphine ou Madagascar et Bourbon ou Mascarenne, les années 1669, 70, 71, et 72.— Paris.

Dupon, J.F., 1973. Relation de l'isle Rodrigue. Texte attribué a Tafforet, circa 1726.— Proc. Roy. Soc. Arts. Sci. Mauritius 4: 1-16.

Farber, P.L., 1982. Discovering Birds. The emergence of Ornithology as a Scientific Discipline, 1760-1850: i-xxiii, 1-191.— Baltimore & London.

Forshaw, J.M., 1989. Parrots of the world: 1-672.— Melbourne.

Fuller, E., 1987. Extinct birds: 1-256.— London & New York.

Fuller, E., 2001. Extinct birds: 1-398.— Oxford.

Greenway, J.C., 1967. Extinct and vanishing birds of the world (2nd ed.).— New York.

Günther, A. & E. Newton, 1879. The extinct birds of Rodrigues.— Phil. Trans. Roy. Soc. Lond. 168: 423-437.

Hachisuka, M., 1953. The dodo and kindred birds, or the extinct birds of the Mascarene Islands: i-xvi, 1-250.— London.

Hahn, C.W., 1834. Ornithologischer Atlas: Papageien: 1-54.— Nürnberg.

Het tvveede Boeck, 1601. Journael oft Dagh-register/inhoudende een warachtig verhael ende historische vertellinghe vande reyse/gedaen door de acht schepen van Amstelredamme/gheseylt in den Maent Martij 1598 onder 't beleydt vanden Admirael Jacob Cornelisz. Neck ende Wybrandt van Warwijck als vice admirael – van hare zeylagie ende gedenwaerdighe zaken ende geschiedenissen haer op de voortz-reys bejeghent. Ghedruct tot Amstelredam by Cornelis Claesz. Opt Water in 't Schrijf-boeck.— Amsterdam.

Holyoak, D., 1971. Comments on the extinct parrot *Lophopsittacus mauritianus*.— Ardea 59: 50-51.

Hume, J.P., 2003. The journal of the flagship Gelderland – dodo and other birds on Mauritius 1601.— Arch. Nat. Hist. 30(1): 13-27.

Hume, J.P. & A.S. Cheke, 2004. The white dodo of Réunion Island: unravelling a scientific and historical myth.— Arch. Nat. Hist. 31(1): 57-79.

Hume, J.P., D.M. Martill & C. Dewdney, 2004. Dutch diaries and the demise of the dodo.— Nature 492: 622.

Jackson, C., 1993. Great bird paintings of the world. Vol. I. The Old Masters.— Suffolk.

Jackson, C., 1999. Dictionary of bird artists of the world.— Woodbridge, Suffolk.

Juniper, T. & M. Parr, 1998. Parrots. A guide to the parrots of the world: 1-584.— East Sussex.

Leguat, F., 1708. Voyage et avantures de Francois Leguat et des ses compagnons en deux isles desertes des Indes Orientales. 2 vols.— Amsterdam.

Livezey, B.C., 1993. An ecomorphological review of the dodo (*Raphus cucullatus*) and solitaire (*Pezophaps solitaria*), flightless columbiformes of the Mascarene Islands.— J. Zool., Lond. 230: 247-292.

Mauduyt, P.J.E., 1784. Histoire naturelle des oiseaux.— In: Encyclopédie Méthodique, 1: 321-91 & vol. 2. Paris & Liége.

Milne-Edwards, A., 1867. Un Psittacien fossile de l'Ile Rodrigues.— Ann. Sci. Nat. (Zool.) (5)8: 145-156.

Milne-Edwards, A. & E. Oustalet, 1893. Notice sur quelques espèces d'oiseaux actuellement éteintes qui se trouvent représentées dans les collections du Muséum d'Histoire Naturelle.— In: Centenaire de la fondation du Muséum d'Histoire Naturelle: 190-252. Paris.

Moree, P., 1998. A concise history of Dutch Mauritius, 1598-1710: 1-127.— London & New York.

Moree, P., 2001. Dodo's en galjoenen. De reis van het schip Gelderland naar Oost-Indie, 1601-1603.— Zutphen.

Mourer-Chauviré, C. & F. Moutou, 1987. Découverte d'une forme récemment éteinte d'ibis endémique insulaire de la Réunion: *Borbonibis latipes* n.gen. n.sp.— Compt Rend. l'Acad. Scienc. Paris, II, 305: 419-423.

Mourer-Chauviré, C., R. Bour, F. Moutou & S. Ribes, 1994. *Mascarenotus* nov. gen. (Aves, Strigiformes), genre endémique éteint des Mascareignes et *M. grucheti* n. sp., espèce éteinte de La Réunion.— Compt Rend. l'Acad. Scienc. Paris, II, 318: 1699-1706.

Mourer-Chauviré, C., R. Bour & S. Ribes, 1995a. Was the solitaire of Réunion an ibis?— Nature 373: 373-568.

Mourer-Chauviré, C., R. Bour & S. Ribes, 1995b. Position systématique du solitaire de la Réunion: nouvelle interprétation basée sur les restes fossiles et les récits des anciens voyageurs.— Compt Rend. l'Acad. Scienc. Paris, IIa, 320: 1125-1131.

Mourer-Chauviré, C., R. Bour, S. Ribes & F. Moutou, 1999. The Avifauna of Réunion Island (Mascarene Islands) at the Time of the Arrival of the First Europeans.— In: S. Olson, (ed.). Avian Paleontology at the Close of the 20th Century. Proc. 4th Int. Meet. Soc. Avian Paleontol. & Evol., Wash., D.C., 4-7 June 1996.

Newton, A., 1869. On a picture supposed to represent the Didine Bird of the island of Bourbon (Réunion).— Trans. Zool. Soc. Lond. 6: 373-376.

Newton, A., 1904. Further discoveries of Dodos' bones.— Nature 70: 626.

Newton, A. & Newton, E., 1876. On the Psittaci of the Mascarene Islands.— Ibis (3)6, 281-289.

Newton, E. & H. Gadow, 1893. On additional Bones of the Dodo and other Extinct Birds of Mauritius obtained by Mr. Theodoré Sauzier.— Trans. Zool. Soc. Lond. 13: 281-302.

North-Coombes, A., 1971. The Island of Rodrigues: 1-338.— Port Louis, Mauritius.

North-Coombes, A., 1980. Le decourverte des Mascareignes par les Arabes et les Portugais. Retrospective et mise au point: 1-105.— Port Louis, Mauritius.

Novak, R.M., 1991. Walker's Mammals of the World. (5th ed.). Vol 1: i-xliv, 1-642.— Baltimore & London.

Owen, R. & W.J. Broderip, 1866. Memoir on the dodo (*Didus ineptus*, Linn): 1-56.— London.

Oudemans, A.C., 1917. Dodo-studien, naar aanleiding van de vondst van een gevelsteen met Dodobeeld van 1561 to Vere.— Verhand. Koninkl. Akad. Wetensch. Amsterdam, 2nd section, 19(4): 1-140.

Oustalet, E., 1897. Notice sur la fauna ornithologique ancienne et moderne des Iles Mascareignes et en particulier de l'Ile Maurice.— Ann. Sci. Nat. Zool. (8)3: 1-128.

Rothschild, W., 1900. A monograph of the genus *Casuarius*.— Trans. Zool. Soc., Lond. 15: 109-148.

Rothschild, W., 1907. Extinct birds.— London.

Rothschild, W., 1919. On one of four original pictures from life of the Reunion or white dodo.— Ibis (11)1: 78-19.

Saddul, P., 1995. Mauritius, a geomorphological analysis.—Mauritius.

Spicer, J., 2000. Savery, Roelandt: 326-328.— In: J. Turner. (ed.). From Rembrandt to Vermeer. 17th-century Dutch artists: 1-422. London.

Valledor de Lozoya, A., 2003. An unnoticed painting of a white dodo.— Journ. Hist. Coll. (15): 201-210.

Wissen, B. van, 1995. Hard Facts: 60-83.— In: B. van Wissen, (ed.). Dodo *Raphus cucullatus* [*Didus ineptus*]: 1-102. Amsterdam.

Received: 12.x.2004
Accepted: 3.iv.2005
Edited: M. Güntert & C. van Achterberg